

CLAIMS

I claim:

1. A method of increasing the ion exchange capacity of ion exchange resin, comprising the step of applying a magnetic field to a resin bed during an ion exchange process.
2. A method of increasing the ion exchange capacity of ion exchange resin according to Claim 1, wherein the step of applying a magnetic field to the resin bed during the ion exchange process comprises applying a varying magnetic field to the resin bed.
3. A method of increasing the ion exchange capacity of ion exchange resin according to Claim 2, wherein the step of applying a varying magnetic field to the resin bed during the ion exchange process includes the steps of placing a coil of wire around the ion exchange column and causing a varying electrical current to flow through the coil of wire to create a varying electromagnetic field in the resin bed.
4. A method of increasing the ion exchange capacity of ion exchange resin according to Claim 3, wherein the electrical current varies as a sine wave.
5. A method of increasing the ion exchange capacity of ion exchange resin according to Claim 3, wherein the electrical current varies as a series of pluses.
6. A method of increasing the ion exchange capacity of ion exchange resin according to Claim 3, wherein the step of applying a varying magnetic field to the resin bed during the ion exchange process additionally includes the step of providing a length of magnetic material in the resin bed to direct the magnetic field to the resin bed.
7. A method of increasing the ion exchange capacity of ion exchange resin according to Claim 2, wherein the step of applying a varying magnetic field to the resin bed during the ion exchange process includes the step of moving at least one magnetic device with respect to the resin bed.

8. A method of increasing the ion exchange capacity of ion exchange resin according to Claim 7, wherein the step of moving at least one magnetic device with respect to the resin bed includes the step of rotating at least one magnet around the ion exchange column and resin bed.

9. A method of increasing the ion exchange capacity of ion exchange resin according to Claim 1, wherein the step of applying a magnetic field to the resin bed during the ion exchange process comprises positioning at least one stationary magnet with respect to the ion exchange column to create a magnetic field in the resin bed in the column.

10. Apparatus for carrying out an ion exchange process using an ion exchange resin with increased ion exchange capacity of the ion exchange resin, comprising:

an ion exchange column;
an ion exchange resin bed in the ion exchange column; and
at least one magnetic device for generating a magnetic field in the ion exchange resin bed.

11. Apparatus for carrying out an ion exchange process with increased ion exchange capacity of the ion exchange resin according to Claim 10, wherein the at least one magnetic device is a stationary magnet located outside of the ion exchange column.

12. Apparatus for carrying out an ion exchange process with increased ion exchange capacity of the ion exchange resin according to Claim 11, wherein the ion exchange column has an outside and wherein the at least one magnetic device is a plurality of stationary magnets positioned around the outside of the ion exchange column.

13. Apparatus for carrying out an ion exchange process with increased ion exchange capacity of the ion exchange resin according to Claim 12, wherein the plurality of stationary magnets are positioned around the outside of the ion exchange column to form a plurality of rings around the column each including a plurality of magnets.

14. Apparatus for carrying out an ion exchange process with increased ion exchange capacity of the ion exchange resin according to Claim 10, wherein the at least one magnetic device is a magnet positioned for rotation around the ion exchange column.

15. Apparatus for carrying out an ion exchange process with increased ion exchange capacity of the ion exchange resin according to Claim 14, additionally including a housing rotatably positioned around the ion exchange column and a motor for rotating the housing, and wherein the at least one magnetic device is mounted in the housing for rotation around the ion exchange column as the housing rotates around the ion exchange column.

16. Apparatus for carrying out an ion exchange process with increased ion exchange capacity of the ion exchange resin according to Claim 10, wherein the at least one magnetic device is a wire wrapped around the ion exchange column to form a wire coil around the ion exchange column adapted to carry an electrical current through the wire to create an electromagnet around the column

17. Apparatus for carrying out an ion exchange process with increased ion exchange capacity of the ion exchange resin according to Claim 16, additionally including a length of magnetic material positioned in the resin bed to direct the magnetic field to the resin bed.

18. Apparatus for carrying out an ion exchange process with increased ion exchange capacity of the ion exchange resin according to Claim 17, wherein the length of magnetic material is a metal bar.

19. Apparatus for carrying out an ion exchange process with increased ion exchange capacity of the ion exchange resin according to Claim 18, wherein the metal bar is cast iron with a protective surface coat thereover.

20. Apparatus for carrying out an ion exchange process with increased ion exchange capacity of the ion exchange resin according to Claim 16, wherein the wire is wrapped directly around the ion exchange column.

21. Apparatus for carrying out an ion exchange process with increased ion exchange capacity of the ion exchange resin according to Claim 16, additionally including an auxiliary length of tubing surrounding the ion exchange column along a length thereof including at least a portion of the resin bed, and wherein the wire is wrapped around the auxiliary tubing.

22. Apparatus for carrying out an ion exchange process with increased ion exchange capacity of the ion exchange resin according to Claim 16, additionally including electrical signal generation circuitry connected to the wire coil to supply a desired electrical signal to the coil.

23. Apparatus for carrying out an ion exchange process using an ion exchange resin with increased ion exchange capacity of the ion exchange resin, comprising:
an ion exchange column;
an ion exchange resin bed in the ion exchange column; and
means for generating a magnetic field in the ion exchange resin bed.